

**COMMANDER NAVAL AIR FORCES  
AVIATION MISHAP INJURY ANALYSIS**

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## AIRFOR AVIATION MISHAP INJURY

In this study injuries that fall under the OPNAVINST 3750.6R were analyzed. Only class C or more severe events from FY2005-FY2009 were included. CNATRA injuries were also included in the analysis; however there were only two events.

During the five years analyzed there were 58 events where an injury was reported. 21 events involved an aircraft impacting terrain at high speed. Since these injuries were the result of a high impact aviation crash, they were not included in the study.

Figure 1 displays the remaining 37 injury events.

ACTION	OBJECT	ASHORE	EMBARKED	TOTAL
STRUCK BY EQUIPMENT	HOOK	1	1	2
	SPOILER	1		1
	NITROGEN HOSE		1	1
	LOAD		1	1
	CANOPY	1		1
	PYLON	1		1
	EXTERNAL FUEL TANK	1		1
	ATFLIR		1	1
	TIRE (SHRAPNEL)		1	1
	FLARES		1	1
STRUCK BY EQUIPMENT Total		5	6	11
FALL	BOARDING LADDER	3		3
	WING	1	2	3
	JET/PROP BLAST	1	1	2
	AIRCRAFT (AIRBORNE)	2		2
	SUCKED INTO INTAKE		1	1
FALL Total		7	4	11
STRUCK BY AIRCRAFT	RUN OVER	2	2	4
	ORDNANCE		1	1
	LAU-11		1	1
STRUCK BY AIRCRAFT Total		2	4	6
SEVERED FINGER	LANDING GEAR STRUT	1		1
	TAIL PYLON		1	1
	LEADING EDGE SLAT	1		1
	EJECTION SEAT		1	1
	COOLING FAN		1	1
	HOIST CABLE	1		1
SEVERED FINGER Total		3	3	6
BIRD STRIKE	BIRD	1		1
WIRE STRIKE	WIRE	1		1
WEATHER	TURBULENCE	1		1
Grand Total		20	17	37

**Fig 1: Injury Events**

"Struck by equipment" events involved injury as a result of a person impacted by a component of a stationary aircraft or other object. "Struck by aircraft" events involved injury from a moving aircraft.

"Struck by equipment" and "falls" are the two highest causes of aviation injury. Less common are "struck by aircraft" and "severed finger". Additionally, the embarked environment has a higher rate (per 100,000 flight hours) of injury than ashore. Figure 2 compares the rates (Minus 1 CNATRA ashore and 1 CNATRA embarked mishaps because there were only 2 CNATRA mishaps compared to 35 AIRFOR.)

	MISHAPS	FLT HRS	RATE
EMBARKED	16	638,545	2.51
ASHORE	19	1,917,528	0.99

**Fig 2: Embarked/Ashore Comparison**

Fisher's test yields a p-value of 0.012 meaning that the embarked rate is significantly higher at the 95% confidence level. (p-value less than 0.05)

Figure 3 shows the number and rate of injury by aircraft.

MODEL	MISHAPS	FLT HRS	RATE	P-VALUE
C-2	2	47,825	4.18	0.253
EA-6B	6	151,886	3.95	0.025
MH-53E	1	26,181	3.82	0.575
F-14	1	30,378	3.29	0.651
E-6	1	69,994	1.43	1.000
F/A-18	14	1,028,718	1.36	0.924
H-60	8	655,458	1.22	1.000
P-3	2	348,632	0.57	0.312
T-45	2	359,914	0.56	0.281
E-2	0	97,602	0.00	-
S-3	0	51,831	0.00	-
Total	37	2868419	1.29	

**Fig 3: Injury Rate By Aircraft**

The only rate that is significantly higher at the 95% confidence level is the EA-6B.

Figure 4 displays more detail on the nature of injury for each aircraft.

ACFT MODEL	ACTION	OBJECT	TOTAL
F018C	STRUCK BY EQUIPMENT	PYLON	1
		FLARES	1
		ATFLIR	1
		EXTERNAL FUEL TANK	1
	STRUCK BY AIRCRAFT	RUN OVER	2
	SEVERED FINGER	LANDING GEAR STRUT	1
F018F	FALL	WING	2
		JET/PROP BLAST	1
	STRUCK BY AIRCRAFT	ORDNANCE	1
		LAU-11	1
	SEVERED FINGER	COOLING FAN	1
	STRUCK BY EQUIPMENT	SPOILER	1
EA006B	STRUCK BY EQUIPMENT	HOOK	1
		NITROGEN HOSE	1
		CANOPY	1
	FALL	BOARDING LADDER	2
	SEVERED FINGER	EJECTION SEAT	1
MH060S	FALL	WING	1
	WIRE STRIKE	WIRE	1
	SEVERED FINGER	HOIST CABLE	1
P003C	WEATHER	TURBULENCE	1
	FALL	BOARDING LADDER	1
SH060F	STRUCK BY AIRCRAFT	RUN OVER	1
	SEVERED FINGER	TAIL PYLON	1
C002A	STRUCK BY EQUIPMENT	TIRE (SHRAPNEL)	1
	FALL	JET/PROP BLAST	1
HH060H	STRUCK BY AIRCRAFT	RUN OVER	1
	STRUCK BY EQUIPMENT	LOAD	1
MH053E	FALL	AIRCRAFT (AIRBORNE)	1
T045C	FALL	SUCKED INTO INTAKE	1
T045A	BIRD STRIKE	BIRD	1
E006B	SEVERED FINGER	LEADING EDGE SLAT	1
F014D	STRUCK BY EQUIPMENT	HOOK	1
SH060B	FALL	AIRCRAFT (AIRBORNE)	1
Grand Total			37

**Fig 4: Injuries By Model And Object**

#### **AVIATION MISHAP INJURY INVOLVED FACTORS**

The following sections detail the involved factors. The factors were analyzed separately for each type of injury. Figure 5 and 6 list the factors for "struck by equipment".

STRUCK BY EQUIPMENT (11 EVENTS)	
LEVEL1	EVENTS
MAINTENANCE PERSONNEL	7
SUPERVISORY	4
FACILITIES PERSONNEL	2
AIRCREW	1

**Fig 5: Level 1 Factors For Struck By Equipment**

STRUCK BY EQUIPMENT (11 EVENTS)			
LEVEL1	LEVEL2	LEVEL3	EVENTS
MAINTENANCE PERSONNEL	PRODUCTION	FAILED TO FOLLOW SAFETY PROCEDURES	1
		FAILED TO FOLLOW TECHNICAL PROCEDURE; STEP BY STEP	3
		FAILED TO IDENTIFY HAZARDOUS CONDITION	1
		FAILED TO REMOVE	1
		FAILED TO USE TECHNICAL DATA/PUBLICATIONS	1
		IMPROPERLY INSTALLED	1
		LOST SITUATIONAL AWARENESS	1
		OVERTORQUED	1
		VIOLATED TECHNICAL DOCTRINE/PROCEDURE	1
	SUPERVISORY	FAILED TO DEMAND ADHERENCE TO TECHNICAL DOCTRINE	2
		FAILED TO MANAGE/SUPERVISE PERSONNEL/ASSETS	2
		FAIL TO PROVIDE ADEQUATE TECH. PROCEDURES	1
SUPERVISORY	FAIL TO PROVIDE/ PROVIDED IMPROPER	INADEQUATELY INSPECTED	1
		OPERATIONAL DATA/PROCEDURE	2
		TECHNICAL DATA/PROCEDURE	2
FACILITIES PERSONNEL	FAILURE TO RECOGNIZE	DESIGN DEFICIENCY	1
	FAIL TO ADEQUATELY SUPERVISE	OTHER FLIGHT/HANGAR DECK/LINE PERSONNEL	1
	FAIL TO ADHERE TO PROCEDURES	STANDARD OPERATING PROCEDURES	1
	FAILED TO PROVIDE	ACCURATE INFORMATION	1
AIRCREW	LOSS OF SA/ FAILED TO IDENTIFY	HAZARDOUS/UNSAFE DECK CONDITION	1
		INADEQUATE FLIGHT PREPARATION/ AIRCRAFT PREFLIGHT	1
		OTHER	1

**Fig 6: Level 1-3 Factors For Struck By Equipment**

The failure to follow procedures was a major reason for these injuries. There also existed a supervisory component involving failure to provide proper data/procedures.

Figures 7 and 8 detail the factors for "falls".

FALLS (11 EVENTS)	
LEVEL1	EVENTS
MAINTENANCE PERSONNEL	5
SUPERVISORY	5
FACILITIES PERSONNEL	2
AIRCREW	1

**Fig 7: Level 1 Fall Factors**

FALLS (11 EVENTS)			
LEVEL1	LEVEL2	LEVEL3	EVENTS
MAINTENANCE PERSONNEL	PRODUCTION	FAILED TO FOLLOW SAFETY PROCEDURES	1
		FAIL TO FOLLOW TECH PROCEDURE; STEP BY STEP	1
		FAILED TO IDENTIFY HAZARDOUS CONDITION	1
		LOST SITUATIONAL AWARENESS	2
		OPERATED EQUIPMENT WITHOUT QUALIFICATION	1
		OTHER	2
	SUPERVISORY	FAILED TO MANAGE/ SUPERVISE PERSONNEL/ ASSETS	2
SUPERVISORY	FAILURE TO PROVIDE/ PROVIDED IMPROPER	HAZARD CONTROLS	1
		HAZARD IDENTIFICATION	1
		OPERATIONAL DATA/PROCEDURE	1
		SAFETY EQUIPMENT	3
		TECHNICAL DESIGN	1
		TRAINING DOCTRINE	1
FACILITIES PERSONNEL	FAIL TO ADEQUATELY SUPERVISE	LAUNCHING CREW	1
	LOSS OF SA/ FAIL TO IDENTIFY	HAZARDOUS/UNSAFE DECK CONDITION	1
		IMPROPER POSITION/DISTANCE	1
		OTHER	1
	FAIL TO SUPERVISE FLIGHT PROPERLY	FAIL TO TAKE CONTROL IN TIME TO PREVENT MISHAP	1
AIRCREW	FAILURE OF AIRCREW COORDINATION	FAILED TO COMMUNICATE	1
		FAILURE OF LEADERSHIP	1
		LOSS OF SITUATIONAL AWARENESS	1
	OTHER	OTHER	1
	VIOLATION OF EXISTING REGULATIONS	INTENTIONAL VIOLATION OF NATOPS	1

**Fig 8: Level 1-3 Fall Factors**

Fall injuries were split between maintenance and supervisory. The main factors were failure to follow procedures, lack of situational awareness and failure to provide proper safety equipment. Details for the three incidents involving improper safety equipment were:

- Inadequate non-skid on the F/A-18F leading edge extension (LEX).
- MH-53E gunner safety belt can be slipped off.
- SH-60B hoist for obese individuals (involved a civilian death).

Figures 9 and 10 detail "struck by aircraft"

STRUCK BY AIRCRAFT (6 EVENTS)	
LEVEL1	EVENTS
FACILITIES PERSONNEL	6
SUPERVISORY	3
MAINTENANCE PERSONNEL	1

**Fig 9: Level 1 Factors For Struck By Aircraft**

STRUCK BY AIRCRAFT (6 EVENTS)			
LEVEL1	LEVEL2	LEVEL3	EVENTS
FACILITIES PERSONNEL	FAIL TO ADEQUATELY SUPERVISE	AIRCRAFT DIRECTOR	1
		AIRCRAFT HANDLERS/ HANDLING CREW	1
		LAUNCHING CREW	1
		OTHER FLIGHT/HANGAR DECK/LINE PERSONNEL	1
		SUBORDINATE PERS NOT OTHERWISE SPECIFIED	1
	FAIL TO ADHERE TO PROCEDURES	NATOPS PROCEDURES	1
		SAFETY PRECAUTIONS/PROCEDURES	3
	FAILED TO PROVIDE	OTHER	1
	FAILED TO RESPOND	TO UNSAFE SITUATION	1
	LOSS OF SA/FAILED TO IDENTIFY	IMPROPER POSITION/DISTANCE	3
		OTHER	2
SUPERVISORY	FAIL TO PROVIDE/ PROVIDED IMPROPER	OPERATIONAL DATA/PROCEDURE	1
		TRAINING DOCTRINE	1
	OTHER	OTHER	1
MAINTENANCE PERSONNEL	SUPERVISORY	FAILED TO SUPERVISE PERSONNEL/ASSETS	1
		FAILED TO PROVIDE ADEQUATE TRAINING	1

**Fig 10: Level 1-3 Factors For Struck By Aircraft**

A previous study showed a large facilities component for mishaps that involved aircraft collisions. The injuries for "struck by aircraft" continue this trend of facilities involvement.

Figures 11 and 12 detail severed finger mishaps.

SEVERED FINGER (6 EVENTS)	
LEVEL1	EVENTS
MAINTENANCE PERSONNEL	3
SUPERVISORY	2
AIRCREW	1
FACILITIES PERSONNEL	1

**Fig 11: Level 1 Severed Finger Factors**

SEVERED FINGER (6 EVENTS)			
LEVEL1	LEVEL2	LEVEL3	EVENTS
MAINTENANCE PERSONNEL	PRODUCTION	FAILED TO FOLLOW TECHNICAL PROCEDURE; STEP BY STEP	1
		FAILED TO IDENTIFY/DETECT FLAW/HAZARDOUS CONDITION	1
		IMPROPERLY INSTALLED	1
		LOST SITUATIONAL AWARENESS	2
		OTHER	1
SUPERVISORY	SUPERVISORY	FAILED TO PROVIDE ADEQUATE TECHNICAL DATA/PROCEDURES	1
		HAZARD IDENTIFICATION	1
		TRAINING	1
AIRCREW	FAILURE OF AIRCREW COORDINATION	FAILED TO COORDINATE ACTIONS	1
	IMPROPER USE OF MISC EQUIPMENT	HOIST/WINCH	1
FACILITIES PERSONNEL	FAIL TO ADHERE TO PROCEDURES	STANDARD OPERATING PROCEDURES	1
	LOSS OF SA/ FAILED TO IDENTIFY	UNSAFE SITUATION NOT OTHERWISE DESCRIBED	1

**Fig 12: Level 1-3 Severed Finger Factors**

Failure to follow procedures and lack of situational awareness were major factors.

Figure 13 details the involved factors for the single wire strike mishap. This mishap was included because the aircraft remained flying and did not impact the terrain. The involved factors were aircrew and supervisory.

WIRE STRIKE (1 EVENT)			
LEVEL1	LEVEL2	LEVEL3	EVENTS
AIRCREW	FAIL TO SEE OBJECT IN TIME TO AVOID COLLISION	WIRE STRIKE	1
	FAILURE OF AIRCREW COORDINATION	FAILED TO COMMUNICATE	1
		FAILED TO MAKE TIMELY DECISION	1
		FAILURE TO BACKUP PLT/COPLT	1
		FAILURE TO USE ALL AVAILABLE RESOURCES	1
		OTHER	1
	INADEQUATE FLIGHT PREPARATION	INADEQUATE MISSION PLANNING	1
	VIOLATION OF EXISTING REGULATIONS	CONTINUED VFR UNDER UNFAVORABLE WEATHER	1
		OTHER	1
		VIOLATION OF GENERAL AIR DISCIPLINE	1
SUPERVISORY	FAILURE TO PROVIDED INADEQUATE	TRAINING DOCTRINE	1
	FAILURE TO RECOGNIZE/ ACCURATELY ASSESS/ DIAGNOSE	FAILING AVIATOR/AIRCREWMAN	1
		OTHER	1

**Fig 13: Level 1-3 Wire Strike Factors**

Figure 14 details the factors for the single weather mishap. All of the factors were aircrew.

WEATHER (1 EVENT)			
LEVEL1	LEVEL2	LEVEL3	EVENTS
AIRCREW	FAILURE OF AIRCREW	FAILED TO MAKE TIMELY DECISION	1
		FAILURE TO USE ALL AVAILABLE RESOURCES	1
	MISCELLANEOUS	DEVIATION FROM NATOPS (NOT INTENTIONAL VIOLATION)	1
	OTHER	OTHER	1

**Fig 14: Level 1-3 Weather Factors**

There was one mishap involving a bird strike with injuries; however there was no fault assigned and no involved factors.